9-35 TEMPORARY TRAFFIC CONTROL MATERIALS

9-35.0 General Requirements

Temporary traffic control materials in this section consist of various traffic communication, channelization and protection items described in Section 1-10 and listed below:

Stop/Slow Paddles
Construction Signs
Wood Sign Posts
Sequential Arrow Signs
Portable Changeable Message Signs
Barricades
Traffic Safety Drums
Barrier Drums
Traffic Cones
Tubular Markers
Warning Lights and Flashers
Truck-Mounted Attenuator
Portable Temporary Traffic Control Signal
Tall Channelizing Devices

The basis for acceptance of temporary traffic control devices and materials shall be visual inspection by the Engineer's representative. No sampling or testing will be done except that deemed necessary to support the visual inspection. Requests for Approval of Material and Qualified Products List submittals are not required. Certification for crashworthiness according to NCHRP 350 will be required as described in Section 1-10.2(3).

"MUTCD," as used in this section, shall refer to the latest WSDOT adopted edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways*. In the event of conflicts between the MUTCD and the Contract provisions, then the provisions shall govern.

9-35.1 Stop/Slow Paddles

Paddles shall conform to the requirements of the MUTCD, except that the minimum width shall be 24-inches.

9-35.2 Construction Signs

Construction signs shall conform to the requirements of the MUTCD and shall meet the requirements of NCHRP Report 350 for Category 2 devices. Except as noted below, any sign/sign stand combination that satisfies these requirements will be acceptable. Post mounted Class A construction signs shall conform to the requirements of this section and additionally shall conform to the requirements stated in Section 9-28.

Aluminum sheeting shall be used to fabricate all construction signs. The signs shall have a minimum thickness of 0.080-inches and a maximum thickness of 0.125-inches.

All orange background signs shall be fabricated with Type X reflective sheeting. All post-mounted signs with Type X sheeting shall use a nylon washer between the twist fasteners (screw heads, bolts or nuts) and the reflective sheeting.

The use of plywood, composite, fiberglass reinforced plastic, new fabric rollup signs, and any other previously approved sign materials except aluminum is prohibited. Any sign which otherwise meets the requirements of this section and was purchased prior to July 1, 2004, may be utilized until December 31, 2007. If a fabric sign is used, it shall have been fabricated with Type VI reflective sheeting.

All Class A and Class B signs shall utilize materials and be fabricated in accordance with Section 9-28 and the Washington State *Sign Fabrication Manual* (M55-05). All regulatory signs having a red background (i.e. Stop, Yield, etc.) shall be fabricated with Type III or IV sign sheeting. All other regulatory information signs (i.e. Speed Limit, Traffic Fines Double in Work Zones, etc) shall have Type II sheeting in rural areas and Type III or IV sheeting in urban areas. All signs having a green background (i.e. Exit arrow, etc.) shall have Type II sheeting for the background and Type III or IV sheeting for the letters, border, and symbols.

9-35.3 Wood Sign Posts

Post sizes for construction signs shall be as follows:

One Post Installation

Post Size	Min. Sign Sq. Ft.	Max. Sign Sq. Ft.
4x4	-	16.0
4x6	17.0	20.0
6x6	21.0	25.0
6x8	26.0	31.0

Two Post Installation

(For signs 5-feet or greater in width)

Post Size	Min. Sign Sq. Ft.	Max. Sign Sq. Ft.
4x4	-	16.0
4x6	17.0	36.0
6x6	37.0	46.0
6x8	47.0	75.0*

* The Engineer shall determine post size for signs greater than 75 square feet.

Sign posts shall conform to the grades and usage listed below. Grades shall be determined by the current standards of the West Coast Lumber Inspection Bureau (WCLIB) or the Western Wood Products Association (WWPA).

4 x 4	Construction grade (Light Framing, Section 122-b WCLIB) or (Section 40.11 WWPA)
4 x 6	No. 1 and better, grade (Structural Joists and Planks, Section 123-b WCLIB) or (Section 62.11 WWPA)
6 x 6, 6 x 8, 8 x 10	No. 1 and better, grade (Posts and Timbers, Section 131-b WCLIB) or (Section 80.11 WWPA)
6 x 10, 6 x 12	No. 1 and better, grade (Beams and Stringers, Section 130-b WCLIB) or (Section 70.11 WWPA)

9-35.4 Sequential Arrow Signs

Sequential Arrow Signs shall meet the requirements of the MUTCD supplemented with the following:

Sequential arrow signs furnished for stationary lane closures on this project shall be Type C.

The color of the light emitted shall be yellow.

The dimming feature shall be automatic, reacting to changes in light without a requirement for manual adjustment.

9-35.5 Portable Changeable Message Signs

Portable Changeable Message Signs (PCMS) shall meet the requirements of the MUTCD and the following:

The PCMS shall employ one of the following technologies:

1. Fiber optic/shutter
2. Light emitting diode
3. Light emitting diode/shutter
4. Flip disk

Regardless of the technology, the PCMS shall meet the following general requirements:

1. Be light emitting and must not rely solely on reflected light. The emitted light shall be generated using fiber optic or LED technology.
2. Have a display consisting of individually controlled pixels no larger than 2½-inch by 2½-inch. If the display is composed of individual character modules, the space between modules must be minimized so alphanumeric characters of any size specified below can be displayed at any location within the matrix.
3. When activated, the pixels shall display a yellow or orange image. When not activated, the pixels shall display a flat black image that matches the background of the sign face.
4. Be capable of displaying alphanumeric characters that are a minimum of 18-inches in height. The width of alphanumeric characters shall be appropriate for the font. The PCMS shall be capable of displaying three lines of eight characters per line with a minimum of one pixel separation between each line.
5. The PCMS message, using 18-inch characters, shall be legible by a person with 20/20 corrected vision from a distance of not less than 800-feet centered on an axis perpendicular to the sign face.
6. The sign display shall be covered by a stable, impact resistant polycarbonate face. The sign face shall be non-glare from all angles and shall not degrade due to exposure to ultraviolet light.
7. Be capable of simultaneously activating all pixels for the purpose of pixel diagnostics. Any sign that employs flip disk or shutter technology shall be programmable to activate the disks/shutters once a day to clean the electrical components. This feature shall not occur when the sign is displaying an active message.

8. The light source shall be energized only when the sign is displaying an active message.
9. Primary source of power shall be solar power with a battery backup to provide continuous operation when failure of the primary power source occurs.
10. The sign controller software shall be NTCIP compliant.

The PCMS panels and related equipment shall be permanently mounted on a trailer with all controls and power generating equipment.

The PCMS shall be operated by a controller that provides the following functions:

1. Select any preprogrammed message by entering a code.
2. Sequence the display of at least five messages.
3. Blank the sign.
4. Program a new message, which may include animated arrows and chevrons.
5. Mirror the message currently being displayed or programmed.

9-35.6 Barricades

Barricades shall conform to the requirements of the MUTCD supplemented by the further requirements of the Standard Plans.

9-35.7 Traffic Safety Drums

Traffic safety drums shall conform to the requirements of the MUTCD and shall have the following additional physical characteristics:

Material	Fabricated from low-density polyethylene that meets the requirements of ASTM D 4976 and is UV stabilized.
Overall Width	18-inch minimum regardless of orientation.
Shape	Rectangular, hexagonal, circular, or flat-sided semi-circular.
Color	The base color of the drum shall be fade resistant safety orange.

The traffic safety drums shall be designed to accommodate at least one portable light unit. The method of attachment shall ensure that the light does not separate from the drum upon impact.

Drums and light units shall meet the crashworthiness requirements of NCHRP 350 as described in Section 1-10.2(3).

When recommended by the manufacturer, drums shall be treated to ensure proper adhesion of the reflective sheeting. Retroreflective bands shall be fabricated from Type III or Type IV reflective sheeting as described in Section 9-28.12.

9-35.8 Barrier Drums

Barrier drums shall be small traffic safety drums, manufactured specifically for traffic control purposes to straddle a concrete barrier and shall be fabricated from low-density polyethylene that meets the requirements of ASTM D 4976 and is UV stabilized.

The barrier drums shall meet the following general Specifications:

Total height	22 in., ± 1 in.
Cross-section	hollow oval 10 in. X 14 in., ± 1 in.
Formed support legs length	13 in., ± 1 in.
Space between legs (taper to fit conc. barrier)	6¼ in. min.
Weight	33 lb. ± 4 lb. with legs filled with sand.
Color	Fade resistant safety orange.

Barrier drums shall have three 4-inch retro-reflective white bands, (one complete and two partial). Bands shall be fabricated from Type III or Type IV reflective sheeting as described in Section 9-28.12.

9-35.9 Traffic Cones

Cones shall conform to the requirements of the MUTCD, except that the minimum height shall be 28-inches.

Retroreflective bands shall be fabricated from Type III or Type IV reflective sheeting as described in Section 9-28.12.

9-35.10 Tubular Markers

Tubular markers shall conform to the requirements of the MUTCD, except that the minimum height shall be 28-inches.

The devices shall be stabilized by affixing them to the pavement by using either weighted bases or adhesive. Adhesive used to glue the device to the pavement shall meet the requirements of Section 9-02.1(8) or 9-26.2. Retroreflective bands shall be fabricated from Type III or Type IV reflective sheeting as described in Section 9-28.12.

9-35.11 Warning Lights and Flashers

Warning lights and flashers shall conform to the requirements of the MUTCD.

9-35.12 Truck-Mounted Attenuator

The Truck-Mounted Attenuator (TMA) shall be selected from the approved units listed on the Qualified Products List. The TMA shall be mounted on a vehicle with a minimum weight of 15,000 pounds and a maximum weight in accordance with the manufacturer's recommendations. Ballast used to obtain the minimum weight requirement, or any other object that is placed on the vehicle shall be securely anchored such that it will be retained on the vehicle during an impact. The Contractor shall provide certification that the unit complies with NCHRP 350 Test level 3 requirements.

The TMA shall have an adjustable height so that it can be placed at the correct elevation during usage and to a safe height for transporting. If needed, the Contractor shall install additional lights to provide fully visible brake lights at all times.

The TMA unit shall have a chevron pattern on the rear of the unit. The standard chevron pattern shall consist of 4-inch yellow stripes, alternating non-reflective black and retro-reflective yellow sheeting, slanted at 45 degrees in an inverted "V" with the "V" at the center of the unit.

9-35.13 Tall Channelizing Devices

Tall channelizing devices shall meet the requirements of the MUTCD Part VI for channelizing devices and shall conform to these general Specifications:

Fabricated of fade resistant, safety orange color, low-density polyethylene that is resistant to deformation upon impact and meets the requirements of ASTM D 4976 and is UV stabilized.

Forty-two inches in height minimum, using a tapered cone type shape of consistent dimensions regardless of orientation to traffic.

Four-inches in width minimum at the top and 8" in width minimum at the base, which incorporates a separate ballast that is designed to resist overturning or other movement from wind gusts or other external forces.

Four retroreflective 6" wide horizontal bands, alternating orange and white beginning 6" from the top of the device. Retroreflective bands shall be fabricated from Type III or Type IV reflective sheeting as described in Section 9-28.12.

Warning lights are not required unless specifically shown on the traffic control Plan but provisions for securely attaching a warning light are required. The method of attachment must ensure that the light does not separate from the device upon impact and light units shall meet the crashworthiness requirements of NCHRP 350 as described in Section 1-10.2(3).

Devices shall be regularly maintained to ensure that they are clean and the reflective sheeting is in good condition.

Except for the Specifications and requirements specifically listed above, Tall Channelizing Devices are defined to be Traffic Cones. All non-conflicting Contract provisions related to "Cones" shall apply to Tall Channelizing Devices.

9-35.14 Portable Temporary Traffic Control Signal

Portable traffic control signals shall meet the requirements of the MUTCD and these specifications.

The portable temporary traffic control signal shall be fully operational for two-phase traffic actuated, pre-timed, or manual control. The portable temporary traffic control signal shall conform to the following requirements:

Controllers shall demonstrate conflict-monitoring capability, consistent with the requirements of Section 9-29.13(2) item number 5, with a flashing red display in both directions. The portable traffic control signal shall be capable of terminating the movement one (1) or movement two (2) all red clearance, in order to repeat the previous movements operation.

Signal head displays shall be either hard wired or controlled by radio signal. Manual operation will not require hardwiring or radio control except for the use of two-way radio communication by manufacturer trained qualified operators.

The system shall be equipped with a means of informing the operator of signal indications, such as a light on the back of each signal head that illuminates when the signal displays a red indication, during manual operation.

A vehicle detection system is required. The system shall be capable of operating either as fixed time or traffic actuated controller. The detection system shall provide presence detection (continuous call to the controller) while there is a vehicle in the detection zone.

Signal supports used with portable traffic control signals shall provide a minimum of two signal displays, spaced a minimum of 8 feet apart. When trailer mounted portable traffic signals are used to provide alternating one-way control, a minimum of one of the signal displays shall be suspended over the traveled way. The minimum vertical clearance to the traveled way for this signal display is 16.5 feet. Vehicular signal heads shall be of the conventional type with standard ITE approved, 12-inch ball LED display. Tunnel visors shall be provided for all indications. The system shall include a countdown display capable of a 199 second countdown clock for motorist information when there is no direct line of sight between the stop bar locations.

Back plates shall be furnished and attached to the signal heads. Back plates shall be constructed of 5 inch wide .050 inch thick corrosion resistant louvered aluminum, with a flat black finish. A highly retroreflective strip, 3-in wide, shall be placed around the perimeter of the face of all vehicle signal backplates to project a rectangular image at night towards oncoming traffic.

Trailers shall have a leveling jack installed at all four corners. The crank for the leveling jacks and trailer hitch shall be locked. The signal pole and mast arm assemblies shall be of the collapsible type, which can be erected and extended at the job site. The mast arm assemblies shall be firmly attached to the trailer to form a stable unit, which can withstand an 80 mph design wind speed with a 1.3 gust factor.

The portable temporary traffic control signal shall be powered using a self-contained battery system capable of providing over 12 days of continuous operations without solar array assistance. A solar panel array will be allowed.